

Maps with sound as the way of elevation representation

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Abstract. Sound maps are not so popular like other and not so interesting for social oriented projects. Basically only these types of thematic maps use sound like the way of representation: political, zoogeographical, vegetation, ethnographic is the most meeting application of sound representation on maps.

This article is about a new way of presenting the terrain with sound that is designed for interactive maps with audio support for disabled people. The method is based on a comparison between the topography and parameters of sound waves.

Keywords: Sound maps, elevation, DEM, multimedia, interactive map

Introduction

Multimedia technologies are one of the most promising and popular areas of cartography and geoinformatics. They aim to create a product containing a collection of images, text and data, accompanied by sound, video, animation and other visual effects (simulation), which includes an interactive interface and other control mechanisms. This definition was formulated in 1988 by European Commission dealing with the introduction and use of new technologies. Multimedia systems, of course, produce a revolution in the fields of education, computer training, in many professional fields, science, art, computer games, etc.

The advent of multimedia prepared as practical requirements, and the development of the theory. However, a sudden spurt in this direction, which occurred over the past few years, provided, first of all, the development of technical and system tools. The development of multimedia is towards unification of heterogeneous types of data in digital form on a carrier in a single system.

Major works of multimedia mapping presented in the form of interactive maps, animations geoimages, electronic and multimedia atlases (Alekseenko N.A., Bushueva I.S., Medvedev A.A., 2009). Interactive maps, multimedia atlases have become a new form of organization of spatial data, providing a new level of efficiency and convenience of obtaining access to a comprehensive analysis of geographic information and to make better management decisions. Huge volumes of information flows and their dynamics are aiming to organize and monitor information resources to modern multimedia productions.

Heading

Problems in the organization of geographic information and data on the basis of multimedia cartography are similar to problems of organizing restructured data:

- Heterogeneity of media - analog (in the form of scientific literature monographs and articles, stock materials - special reports on the results of field research projects, various paper maps, aerial photos, etc.) and electronic (in the form of digital maps, satellite images, audio and video, etc., placed in the environment including the Internet);
- Fragmented (information most often refers to a specific area, with different themes can be different "covered" information);
- Split-level information (information may relate to the whole problem as a whole, to a certain part of it, to a particular element of the problem);
- Varying degrees of reliability (information may contain specific information of varying degrees of reliability, indirect data, the results are based on reliable information or indirect conclusions);
- Possible inconsistencies (information from different sources can be the same, slightly different or even contradictory);
- Variability in time (the problem develops over time, so the information at different times of the same elements of the problem can and should vary) (Medvedev, 2012).

Modern multimedia cartographic products widely use sound, primarily for "clarification" of the objects depicted: when showing them by the cursor one can hear audio cues, sounds the name of the object or a verbal description.

Special software modules allow you to play real sounds, such as the murmur of the brook, the rustling of the forest, and it creates the illusion of presence on the ground. You can further enhance the perception of the environment, recreating the sound of rain, thunder, rumbling volcano, etc.

Another direction of the use of sound effects - to characterize the quality. Thus, the approach of the cursor to the parts of the image, poorly secured data or having a lack of precision, increased noise, symbolizing the presence of interference.

Electronic technologies can add to the traditionally used in cartography and graphic tools are varying nature of sound, its loudness, pitch, duration. Conducted dozens of experiments to determine what are the rules for the use of sound in the virtual mapping, how to combine animation and sound. Clear, for example, the image requires the introduction of its noise (Berlyant, 1996, 2001).

If we listen to the environment, we can understand some truths, very important for the development of multimedia cartographic works with sound:

- The sound is always associated with a physical source;
- reaction to sound differs from the experience of the listener;

- recognition of the sound associates with previous experience.

To create a compelling audimedia, sound design should reflect the real sounds.

Judicious use of music and sound effects can significantly improve multimedia works created. Modern multimedia software equipment is one of the best ways to spread the sound, since it has built-in features of compression, with a library of sounds, free reusable sound effects pan and rise / decay of sound, and the ability to call with instructions written on various programming languages. It should be noted that the use of sound in electronic cartographic works should be treated with caution. Incorrect scoring of landscape elements can impair showiness of its use.

Most existing multimedia cartographic uses two types of sounds: sound events, and streaming audio. Sound events are often used to create a short sound effects or sounds, for which complete (from start to finish) sync with the timeline is not necessary. Streaming sound, in turn, starts immediately after loading a sufficient part of the audio data, and remains active until explicitly stopped by the user. Streaming audio is synchronized with the playback of animated maps.

There are some very significant observations concerning the work with sound in multimedia cartography:

- Do not use one and the same sound as a sound event, and as streaming audio, as this leads to false perceptions and associations;
- several sounds played simultaneously, often lead to a significant loss of concentration by the user. Should not appoint more than two sounds that are played in the same time;
- is often easier to create short music loops that can be used many times. This eliminates the need for a long and surround sound tracks.

An examples of the use of sound effects and sound maps is "The multimedia atlas Kuril Islands", a multimedia mapping project "Winners» (www.pobediteli.ru), interactive sound map of North Carolina, web project based on static maps " Sounds of London "and series of interactive maps using sound base on GoogleMaps. Sounds and sound effects used in these products have the potential uses of the network environment, the local workplace, as well as offline and affordable handheld PDAs.

"Multimedia Atlas of the Kuril Islands" is a direct descendant of the classic paper atlases. It was created with the help of modern computer technology and is intended for distribution in all media and electronic information via the Internet. It includes a system of interrelated and complementary to each other maps in the form of geographical encyclopedia, concentrating knowledge and understanding of the area and the community. Information is transmitted in the atlas to visualize, intelligible to read, study, and for future reference and visualization. The types of multimedia contained in the atlas are collection of maps, text, animations, videos, photos, space images, digital elevation models, sound effects (Medvedev, 2007).

Multimedia mapping project "winners" is built on a series of animated maps using elements of sound design and dubbing. The "winners" was created for the 60th anniversary of the Victory. Using the model rendered in the course of the war project combines historical facts, contemporary memoirs and archival chronicle.

Interactive Sound of North Carolina and a web project "Sounds of London" are similar in imaging technology. Both of these projects are based on static maps, and the sounds and sound effects tied to symbols on the map.

Using sound-based interactive maps GoogleMaps closely associated with the trend of development of the web industry, and Google in particular. Recent years a widespread adoption of interactive multimedia services in the Internet environment, and sound cards were worthy of confirmation of this trend.

After analyzing numerous multimedia and animated cartographic works with sound and sound effects can be made that not all elements of the landscape and all the events of the real world has a soundtrack. As an example, an element of the landscape, as a relief. All existing methods of imaging the terrain it appears to us a graphical representation or model.

If more deeply into the nature of sound, and it is in his physical characteristics, while the sound is a wave that has a frequency and amplitude of vibration, then it is possible to spend a lot of parallels with hypsometric characteristics of the terrain. When considering the sound wave in graphical and hypsometric profile of a territory, you can find a lot in common (Medvedev, 2011).

In a sound wave on the X axis is the frequency, and the Y decibels, and hypsometric profile, distance and altitude. You can also draw analogies sound wave and digital elevation model. A graphical method for constructing a sound wave, if the two parameters (frequency and decibel) add a third parameter time, the graphical picture of sound piano keys lasting a few seconds it will be very similar to a digital model of any ridge fades into the foothills, and then in the plain.

Unlike visualization, playback sound of relief primarily aims to play in the image of the real picture for a person to hear and imagine.

This is an extremely delicate operation scheme, since it is necessary to pick up very subtle sound effects to the user presented an image of the terrain. It should be noted that a sound method above can be used to pass through not only the sound characteristics of a relief, but also other quantitative and qualitative indicators, and perform a number of other educational functions.

Conclusion

Currently, visualization of sound image has reached a high level, although now there are still many unsolved problems. With the development of computer technology and methods of reproducing representations of geographic information received new direction. From the point of view of mapping, the proposed method of presentation of the terrain makes the map one more link in the chain of transmission of information. According to the information and communication concept, a person briefed on the real world of the cards in the chain world-map-man, in the case of sound transmission through interactive maps person receives information from the sound: the world-map-sound-man. With the developed software of blind and visually impaired people can listen to the sounds of relief in Russia and other countries. This development creates a new information channel to understand the world through maps. Opportunity not only to "see" map, but "listen" to it.

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